

WHAT IS CLAIMED IS:

1. A probe opening fabricating apparatus for creating an opening with desired dimensions at a mask tip of a near-field optical microscope probe, said probe including a core made of a material having a light transmission property and a mask formed on a surface of said core and made of a material having a ductility and a light shielding property; said apparatus comprising:

a light source;

light emission means having an abutting surface which comes into abutment against said tip, said light emission means being photoexcited by incident light from said light source, directed via said core to said opening, to thereby emit light from said abutting surface;

light detection means for detecting the quantity of light of emitted light from a site where said tip abuts against said light emission means;

press means for pressing said tip against said light emission means along the direction of the optical axis;

storage means for storing in advance calibration information on the quantity of light of said emitted light and the dimensions of said opening;

calculation means for figuring out the quantity of light of said emitted light for the acquisition of said opening with desired dimensions, from said calibration information stored in said storage means; and

press control means for controlling pressing of said probe tip against said light emission means in the direction of the optical axis, effected by said press means, so as to allow the quantity of light of said emitted light detected by said light detection means to become equal to the quantity of light figured out by said calculation means; and

said light source is substituted by voltage application means for applying DC voltage to said light emission means, and wherein

said light emission means are excited by voltage applied by said voltage application means, to emit light.

2. A near-field optical microscope having a probe opening fabricating apparatus according to claim 1, said near-field optical microscope acquiring information on a surface to be measured of a sample by

(a) an illumination-collection mode in which evanescent light is illuminated on said surface to be measured of said sample, said evanescent light emerging from an opening at a probe tip which has said opening created by said opening fabricating apparatus, the resultant scattered light or reflected light being collected through said opening; or

(b) an illumination mode in which evanescent light is illuminated on said surface to be measured of said sample, said evanescent light emerging from said opening at said probe tip which has said opening created by said opening fabricating apparatus, the resultant scattered light or reflected light being collected through an external optical system; or

(c) a collection mode in which a field of said evanescent light appearing on said surface to be measured of said sample is scattered by said probe tip which has said opening created by said opening fabricating apparatus, the resultant scattered light being collected through said opening.

3. The near-field optical microscope according to claim 2, further comprising:
an opening diameter checking mechanism for checking the dimensions of an opening at said probe tip where said opening is formed, said opening diameter checking mechanism comprising:

voltage application means for applying DC voltage to said light emission means;

light emission means having an abutting surface which comes into abutment against said tip, said light emission means being excited by voltage applied by said voltage application means, to thereby emit light from said abutting surface;

light detection means for detecting the quantity of light of emitted light from a site where said tip abuts against said light emission means;

press means for pressing said tip against said light emission means in the direction of the optical axis;

storage means for storing in advance calibration information on the quantity of light of said emitted light and the dimensions of said opening; and

comparison means for collating the quantity of light of said emitted light detected by said light detection means with said calibration information stored in said storage means, to thereby find the dimensions of said opening at said probe tip.

4. The near-field optical microscope according to claim 3, further comprising:
an opening diameter adjusting mechanism for altering the dimensions of an opening at said probe tip where said opening is formed, said opening diameter adjusting mechanism comprising:

voltage application means for applying DC voltage to said light emission means;

light emission means having an abutting surface which comes into abutment against said tip, said light emission means being excited by voltage applied by said voltage application means, to thereby emit light from said abutting surface;

light detection means for detecting the quantity of light of emitted light from a site where said tip abuts against said light emission means;

press means for pressing said tip against said light emission means in the direction of the optical axis;

storage means for storing in advance calibration information on the quantity of light of said emitted light and the dimensions of said opening;

setting means for setting desired dimensions of said opening at said probe tip;

calculation means for figuring out the quantity of light of said emitted light for the acquisition of said opening having dimensions set by said setting means, from said calibration information stored in said storage means; and

press control means for controlling pressing of said probe tip against said light emission means in the direction of the optical axis, effected by said press means, so as to allow the quantity of light of said emitted light detected by said light detection means to become equal to the quantity of light figured out by said calculation means.

5. The near-field optical microscope according to claim 4, wherein

said probe is formed from glass fiber, said probe including a scattering layer adjacent externally to a cladding layer of said glass fiber, said scattering layer having a refractive index substantially equal to the refractive index of said cladding layer.